



Florida Department of Transportation

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SECRETARY

July 20, 2011

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section **330**
Proposed Specification: **3300000 Hot Mix Asphalt – General Construction Requirements.**

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes were proposed by Jim Musselman of the State Materials Office to provide an overall update of the Section. Sections 320 and 330 have overlapped with each Section containing roadway and plant requirements. Section 320 will now address plant requirements and Section 330 will address roadway requirements.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to SP965RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4280.

Sincerely,

Rudy Powell, Jr., P.E.
State Specifications Engineer

RP/cah
Attachment

cc: Gregory Jones, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

HOT MIX ASPHALT – GENERAL CONSTRUCTION REQUIREMENTS. (REV 75-2018-11)

SECTION 330 (Pages 250–265) is deleted and the following substituted:

SECTION 330 HOT ~~BITUMINOUS MIXTURES~~MIX ASPHALT - GENERAL CONSTRUCTION REQUIREMENTS

330-1 Description.

~~Construct plant mixed~~*This Section specifies the basic equipment and construction requirements for hot bituminous mix asphalt (including warm mix asphalt)* pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-2 Quality Control (QC) Requirements.

330-2.1 Minimum ~~Quality Control~~QCPlan Requirements: In addition to the requirements set forth in Section 105, ~~perform~~*describe in the Quality Control Plan (QCP) how the following attributes will be monitored: pavement density, mix temperature, pavement smoothness, pavement cross-slope, mix spread rate, and pavement texture, including methods for monitoring pavement segregation and the corrective actions that will be taken to resolve any identified problems. Perform* as a minimum the following activities necessary to maintain process control and meet ~~specification~~*Specification* requirements:

~~Stockpiles: Assure materials are placed in the correct stockpile; assure good stockpiling techniques; inspect stockpiles for separation, contamination, segregation, etc.; properly identify and label each stockpile.~~

~~Incoming Aggregate: Obtain gradations and bulk specific gravity (G_{sb}) values from aggregate supplier for reference; determine the gradation of all component materials; routinely compare gradations and G_{sb} values to mix design.~~

~~Cold Bins: Calibrate the cold gate/feeder belt for each material; determine cold gate/feeder belt settings; observe operation of cold feeder for uniformity.~~

~~Dryer: Observe pyrometer for aggregate temperature control; observe efficiency of the burner.~~

~~For Batch Plants, determine percent used and weight to be pulled from each bin to assure compliance with Mix Design, check mixing time, and check operations of weigh bucket and scales.~~

~~For Drum Mixer Plants, determine aggregate moisture content, and calibrate the weigh bridge on the charging conveyor.~~

~~Control Charts: Plot and keep charts updated daily for all Quality Control Sampling and Testing and post in the asphalt lab where they can be seen. Provide the following charts:~~

~~1. All components used to determine the composite pay factor (No. 8 sieve, No. 200 sieve, asphalt binder content, air voids, and density) by lot.~~

~~2. Gradation of incoming aggregate.~~

~~———— *Pavement Density:* ———— 3. Gradation, asphalt binder content, and maximum specific gravity (G_{mm}) of RAP.~~

~~———— 4. Any other test result or material characteristic (as determined by the Contractor) necessary for process control.~~

~~———— The above listed minimum activities are to be considered normal activities necessary to control the production of hot mix asphalt at an acceptable quality level. It is recognized, however, that depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored.~~

~~———— **330-2.2 Minimum Process Control Testing Requirements:** Perform, as a minimum, the following activities at the testing frequencies provided below:~~

~~———— Asphalt Plant~~

~~———— 1. Asphalt Mix: Determine the asphalt binder content; mix gradation and volumetric properties at a minimum frequency of one per day. In the event that the daily production exceeds 1,000 tons, perform these tests a minimum of two times per day. Quality Control tests used in the acceptance decision may be used to fulfill this requirement. Verify modifier addition.~~

~~———— 2. Aggregate: Test one sample for gradation per 1,000 tons of incoming aggregate, as it is stockpiled.~~

~~———— 3. Aggregate moisture content from stockpiles or combined cold feed aggregate — one per day.~~

~~———— 4. RAP: Test one sample per 1000 tons of incoming material (prior to incorporation into the mix) for gradation and asphalt binder content. Test one sample per 5,000 tons of incoming material (prior to incorporation into the mix) for maximum specific gravity (G_{mm}) and recovered viscosity.~~

~~———— 5. Mix temperature at the plant for the first five loads and one out of every five loads thereafter.~~

~~———— 6. Other tests (as determined necessary by the Contractor) for process control.~~

~~———— Roadway~~

~~———— 1. Monitor the pavement temperature with an infrared temperature device *so that compaction is completed before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.* Monitor the roadway density with either 6 ~~inches~~^{inch} diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement. ~~When the layer thickness is greater than or equal to 1 inch (or the spread rate is greater than or equal to 105 lb per yd²) and an approved rolling pattern is used in lieu of density testing, identify in the QC Plan how the pavement density will be monitored.~~~~

~~———— 2. Mix *Temperature: Determine the mix* temperature at the roadway for the first five loads and one out of every five loads thereafter.~~

~~3. ————— 3. Monitor the pavement smoothness with a 15-foot rolling straightedge, as required by these specifications.~~

~~4. Monitor the pavement cross slope at a frequency necessary to fulfill the requirements of these specifications, and identify a system to control the cross slope of each pavement layer during construction.~~

~~5. *Mix Spread Rate:* Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed to ensure that the spread rate is within 5% of the target spread rate.~~
 When determining the spread rate, use, at a minimum, an average of five truckloads of mix. ~~When the average spread rate is beyond plus or minus 5% of the target spread rate, monitor the thickness of the pavement layer closely and adjust the construction operations.~~

~~If the Contractor fails to maintain an average spread rate within plus or minus 5% of the target spread rate for two consecutive days, the Engineer may elect to stop the construction operation at any time until the problem is resolved.~~

~~6. Monitor the mix~~ *4. Pavement Texture: Monitor the pavement* texture to minimize pavement segregation. Use density gauges, infrared temperature measurement devices, or roadway cores at the beginning of each day's production, and as necessary, both at truck exchanges and during normal paving operations.

5. Reporting: Ensure the accuracy of the Quality Control Roadway Reports on the Department's approved form to reflect the actual surface area of the finished work and be in compliance with the requirements of the Contract Documents.
~~Identify in the QC Plan the methods chosen for monitoring pavement segregation and the corrective actions that will be taken to resolve any identified problems.~~

~~330-2.3 Minimum Quality Control System Requirements:~~

~~330-2.3.1 Personnel Qualifications:~~ Provide *Quality Control QC* Technicians in accordance with Section 105.

~~330-2.3.2 Hot Mix Asphalt Testing Laboratory Requirements:~~ Furnish or have furnished a fully equipped asphalt laboratory (permanent or portable) at the production site. The Laboratory must be qualified under the Department's Laboratory Qualification Program, as described in Section 105-6. In addition, the laboratory shall meet the following requirements:

~~1. Area—The effective working area of the laboratory shall be a minimum of 180 ft², with a layout of which will facilitate multiple tests being run simultaneously by two technicians. This area does not include the space for desks, chairs and file cabinets. Any variations shall be approved by the Engineer.~~

~~2. Lighting—The lighting in the lab must be adequate to illuminate all areas of the work.~~

~~3. Temperature Control—Equip the lab with heating and air conditioning units that provide a satisfactory working environment.~~

~~4. Ventilation—Equip the lab with fume hoods and exhaust fans that will remove all hazardous fumes from within the laboratory in accordance with OSHA requirements.~~

~~5. Equipment and Supplies—Furnish the lab with the necessary sampling and testing equipment and supplies for performing contractor Quality Control and Department Verification Sampling and Testing. A detailed list of equipment and~~

supplies required for each test is included in the appropriate FDOT, AASHTO, or ASTM Test Method.

6. Calibration of the Superpave Gyratory Compactor: Calibrate the Superpave Gyratory Compactor in accordance with the manufacturer's recommendations. Identify in the Quality Control Plan the established frequencies and document all calibrations.

7. Personal Computer—Provide a personal computer capable of running a Microsoft Excel™ spreadsheet program, along with a printer.

8. Communication—Provide a telephone and fax machine (with a private line) for the use of the testing facility's quality control personnel. In addition, provide an Internet connection capable of uploading data to the Department's database and for e-mail communications.

330-3 Limitations of Operations.

330-3.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the *layingpaving* operations.

330-3.2 Limitations of *LayingPaving* Operations:

330-3.2.1 General: *SpreadPlace* the mixture only when the surface upon which it is to be *laiedplaced* has been previously prepared, is intact, firm, dry, clean, and the tack or prime coat, with acceptable spread rate, is properly broken or cured. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

330-3.2.2 Ambient Air Temperature: *SpreadPlace* the mixture only when the air temperature in the shade and away from artificial heat *is at least 40°F for layers greater than 1 inch (100 lb/yd²) in thickness and at least 45°F for layers 1 inch (100 lb/yd²) or less in thickness (this includes leveling courses). The minimum temperature requirement for leveling courses with a spread rate meets requirements of 50 lb/yd² or less is 50°F* *Table 330-1*. The minimum ambient temperature requirement may be reduced by 5°F when using warm mix technology, if mutually agreed to by both the Engineer and the Contractor. *For friction course mixtures, meet the requirements of 337-7.*

330-3.2.3 Wind: Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-3.2.4 Night Paving: Meet the requirements of 8-4.1.

330-4 Preparation of Asphalt Binder.

Deliver the asphalt binder to the asphalt plant at a temperature not to exceed 370°F, and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of 300-3.2. Maintain the asphalt binder in storage within a range of 230 to 370°F in advance of mixing operations. Maintain constant heating within these limits, and do not allow wide fluctuations of temperature during a day's production.

330-5 Preparation of Aggregates.

330-5.1 Stockpiles: Place each aggregate component in an individual stockpile, and separate each from the adjacent stockpiles, either by space or by a system of

bulkheads. Prevent the intermingling of different materials in stockpiles at all times. Identify each stockpile, including RAP, as shown on the mix design.

———— **330-5.2 Prevention of Segregation:** Form and maintain stockpiles in a manner that will prevent segregation. If a stockpile is determined to have excessive segregation, the Engineer will disapprove the material for use on the project until the appropriate actions have been taken to correct the problem.

———— **330-5.3 Blending of Aggregates:** Stockpile all aggregates prior to blending or placing in the cold hoppers. Place all aggregates to be blended or proportioned in separate bins at the cold hopper. Proportion by means of securely positioned calibrated gates or other approved devices.

———— **330-5.4 Cold Bins:**

———— **330-5.4.1 Adequacy of Bins:** Use separate bin compartments in the cold aggregate feeder that are constructed to prevent any spilling or leakage of aggregate from one bin to another. Ensure that each bin compartment has the capacity and design to permit a uniform flow of aggregates. Mount all of the bin compartments over a feeder of uniform speed, which will deliver the specified proportions of the separate aggregates to the drier at all times. If necessary, equip the bins with vibrators to ensure a uniform flow of the aggregates at all times.

———— **330-5.4.2 Gates:** Provide each bin compartment with a gate which is adjustable in a vertical direction. Provide gates that can be held securely at any specified vertical opening. Equip the gates with a measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

———— **330-5.5 Mineral Filler:** If mineral filler is required in the mix, feed or weigh it in separately from the other aggregates.

———— **330-5.6 Heating and Drying:** Heat and dry the aggregates before screening. Control the temperature of the aggregates so that the temperature of the completed mixture at the plant falls within the permissible range allowed by this Section.

———— **330-5.7 Screening Unit:**

———— **330-5.7.1 Oversize Aggregate:** Remove any oversized pieces of aggregate by the use of a scalping screen. Do not return this oversized material to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.

———— **330-5.7.2 Screening:** Ensure that the quantity of aggregates being discharged onto the screens does not exceed the capacity of the screens to actually separate the aggregates into the required sizes. Allow up to a maximum of 10% plus 10 material in the minus 10 bin. The Engineer will determine the maximum amount of minus 10 material allowed in the plus 10 bins, in accordance with its effect on the uniformity of the mix.

330-6 Preparation of the Mixture.

———— **330-6.1 Batch Mixing:**

———— **330-6.1.1 Aggregates:** Once the dried aggregates and mineral filler (if required) are prepared in the manner previously described and combined in batches to meet the verified mix design by weighing each separate bin size, convey them to the empty mixer.

~~**330-6.1.2 Asphalt Binder:** Introduce the accurately measured hot asphalt binder into the mixer simultaneously with, or after, the hot aggregates. Continue mixing until the mixture is thoroughly uniform with all particles fully coated.~~

~~**330-6.1.3 Mixing Time:** The mixing time begins when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and continues until the material begins to leave the mixing unit. Since the mixing time varies in relation to the nature of the aggregates and the capacity of the mixer, mix sufficiently to produce a thoroughly and uniformly coated mixture.~~

~~**330-6.2 Continuous Mixing:** Introduce the dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the verified mix design, into the mixer in synchronization with the accurate feeding of the hot asphalt binder. Mix sufficiently to produce a thoroughly and uniformly coated mixture.~~

~~**330-6.3 Mix Temperature:** Heat and combine the ingredients of the mix in such a manner as to produce a mixture with a temperature, when discharged from the pugmill or surge bin, which is within the master range as defined below.~~

~~Determine the temperature of the completed mixture using a quick-reading thermometer through a hole in the side of the loaded truck immediately after loading. Locate 1/4 inch hole on both sides of the truck body within the middle third of the length of the body, and at a distance from 6 to 10 inches above the surface supporting the mixture. If a truck body already has a hole located in the general vicinity of the specified location, use this hole. At the Engineer's discretion, the Contractor may take the temperature of the load over the top of the truck in lieu of using the hole in the side of the truck.~~

~~The normal frequency for taking asphalt mix temperatures will be for each day, for each design mix on the first five loads and one out of every five loads thereafter. Take the temperature of the asphalt mix at the plant and at the roadway before the mix is placed at the normal frequency. Record the temperature on the front of the respective delivery ticket. The Engineer shall review the plant and roadway temperature readings and may take additional temperature measurements at any time.~~

~~The master range for all mix designs will be the target mix temperature from the mix design $\pm 30^{\circ}\text{F}$. There are two master ranges; one at the asphalt plant (mixing temperature from the mix design $\pm 30^{\circ}\text{F}$) and one at the roadway (compaction temperature from the mix design $\pm 30^{\circ}\text{F}$). Reject any load or portion of a load of asphalt mix at the plant with a temperature outside of this master range. Reject any load or portion of a load of asphalt mix at the roadway with a temperature outside of this master range. The Engineer will be immediately notified of the rejection.~~

~~If any single load at the plant or at the roadway is within the master range but differs from the target mix temperature by more than $\pm 25^{\circ}\text{F}$ or if the average difference of the temperature measurements from the target mix temperature for five loads exceeds $\pm 15^{\circ}\text{F}$, the temperature of every load will be monitored until the temperature falls within the specified tolerance range in Table 330-1; at this time the normal frequency may be resumed.~~

Table 330-1

Ambient Air Temperature Tolerance From Verified Mix Design	
Any Single Measurement	Layer Thickness or Asphalt Binder
	$\pm 25^{\circ}\text{F}$ Minimum

<i>Type</i>	<i>Temperature (°F)</i>
<i>Average of Any Five Consecutive Measurements $\leq \frac{1}{2}$ inch</i>	<i>$\pm 15^{\circ}\text{F}$ 50</i>
<i>≤ 1 inch or any mixture containing a PG asphalt binder having a high temperature designation greater than PG 67</i>	<i>45</i>
<i>> 1 inch</i>	<i>40</i>

~~———— **330-6.4 Maximum Period of Storage:** Allow the maximum time that any mix may be kept in a hot storage or surge bin to be 72 hours.~~

~~———— **330-6.5 Contractor's Responsibility for Mixture Requirements:** Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.~~

~~**330-7 Transportation of the Mixture.**~~

~~———— Transport the mixture in tight vehicles previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Cover each load during cool and cloudy weather and at any time it appears rain is likely during transit with a tarpaulin or waterproof cover meeting requirements of 320-5.4.~~

~~**330-8 Preparation of Application Surfaces.**~~

~~———— **330-8.1 Cleaning:** Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.~~

~~———— **330-8.2 Patching, Leveling, and Overbuild Courses:** Where an asphalt mix is to be placed on an existing pavement or old base which is irregular, and wherever the plans indicate, bring the existing surface to proper grade and cross section by the application of patching, leveling, or overbuild courses.~~

~~———— **330-8.3 Application Over Surface Treatment:** Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.~~

~~———— **330-8.4 Coating Surfaces of Contacting Structures:** Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavement, curbs and gutter, with a uniform coating of asphalt binder to provide a closely bonded, watertight joint.~~

~~**330-8.5 Tack Coat:**~~

~~———— **330-8.5.1 Tack Coat Required:** Apply a tack coat, as specified in Section 300, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.~~

~~———— **330-8.5.2 Tack Coat at Engineer's Option:** Apply a tack coat on the following surfaces only when so directed by the Engineer:~~

~~- 1. Freshly primed bases.
- 2. Surface treatment.~~

330-9 Placing Mixture.**330-9.1 Requirements Applicable to All Types:**

~~330-9.1.1 Alignment of Edges:~~ Lay all asphalt concrete mixtures, including leveling courses, other than the pavement edge just adjacent to curb and gutter or other true edges, by the stringline method to obtain an accurate, uniform alignment of the pavement edge.

~~330-3.2~~ Control the unsupported pavement edge to ensure that it will not deviate more than ± 1.5 inches from the stringline.

~~330-9.1.2 Temperature of Spreading:~~ Maintain the temperature of the mix at the time of spreading within the master range as defined in 330-6.3. The minimum frequency for taking mix temperatures on the roadway will be as indicated in 330-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. The Engineer will be immediately notified of the rejection.

~~330-9.1.3 Rain and Surface Conditions:~~ Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and *standing* water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in ~~330-9.1.2~~ *320-6.3*, the Contractor may then place the mixture caught in transit.

330-3.2.4 Wind: Do not place the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-4 Surface Preparation.

330-4.1 Cleaning: Prior to placing the mixture, clean the surface of the base or underlying pavement of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

330-4.1.1 Application over Asphalt Rubber Membrane Interlayer (ARMI): Where an asphalt mix is to be placed over a newly constructed ARMI, do not sweep or otherwise disturb the cover material prior to placing the asphalt mix, unless directed by the Engineer.

330-4.2 Tacking: Apply a tack coat on all existing pavement surfaces that are to be overlaid with an asphalt mix as specified in Section 300 and between successive layers of all asphalt mixes. Apply a tack coat on freshly primed bases only when so directed by the Engineer.

330-5 Paving Equipment.

330-5.1 General Requirements: Use equipment that is mechanically sound (~~free from leaks, etc.,~~) ~~that is~~ and capable of consistently meeting the requirements of these Specifications.

330-5.2 Asphalt Paver:

330-5.2.1 General: Provide an asphalt paver that is self-propelled, can be steered, and is equipped with a receiving and distribution hopper and a mechanical

screed. Use a mechanical screed capable of adjustment to regulate the depth of material spread and to produce the desired cross-section.

330-5.2.2 Automatic Screed Control: For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25 feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

330-5.2.3 Screed Width: ~~Provide paving machines on full width lanes that have a screed width greater than 8 feet.~~ Provide an asphalt paver having a screed width greater than 8 feet when required to pave full width lanes. Do not use extendable screed strike-off devices that do not provide preliminary compaction of the mat in place of fixed screed extensions. Use a strike-off device only on irregular areas that would normally be done by hand and on shoulders 5 feet or less in width. When using the strike-off device on shoulders in lieu of an adjustable screed extension, demonstrate the ability to obtain an acceptable texture, density, and thickness.

When using an extendable screed device to extend the screed's width on the full width lane or shoulder by 24 inches or greater, the Engineer will require an auger extension, paddle, or kicker device unless written documentation from the manufacturer is provided that these are not necessary.

330-5.3 Rollers:

330-5.3.1 Steel-Wheeled Rollers: Provide compaction equipment capable of meeting the density requirements described in these Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a tandem steel-wheeled roller weighing 5 to 15 tons for breakdown rolling. For finish rolling, use a separate roller with a weight of 5 to 15 tons. Variations from these requirements shall be approved by the Engineer.

330-5.3.2 Traffic Rollers: Provide compaction equipment capable of meeting the density requirements described in the Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a self-propelled, pneumatic-tired traffic roller equipped with at least seven smooth-tread, low pressure tires, equipped with pads or scrapers on each tire. Maintain the tire pressure between 50 and 55 psi or as specified by the manufacturer. Use rollers with a minimum weight of 6 tons. Do not use wobble-wheeled rollers. Variations from these requirements shall be approved by the Engineer.

330-5.3.3 Prevention of Adhesion: Do not allow the mixture to adhere to the wheels of any rollers. Do not use fuel oil or other petroleum distillates to prevent adhesion. Do not use any method which results in water being sprinkled directly onto the mixture.

330-5.4 Coring Equipment: Furnish a suitable saw or drill for obtaining the required density cores.

330-5.5 Hand Tools: Provide the necessary hand tools such as rakes, shovels, ~~etc~~ and other similar tools, and a suitable means for keeping them clean.

330-6 Placing Mixture.

330-6.1 Requirements Applicable to All Pavement Types:

330-6.1.1 Alignment of Edges: Place all asphalt mixtures by the stringline method to obtain an accurate, uniform alignment of the pavement edge. As an exception, pavement edges adjacent to curb and gutter or other true edges do not require a stringline. Control the unsupported pavement edge to ensure that it will not deviate more than plus or minus 1.5 inches from the stringline. ~~330-9~~

330-6.1.2 Paving Width: If necessary due to the traffic requirements, place the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, place the mixture to the full width with machines traveling in echelon.

330-6.1.3 Mix Temperature: Maintain the temperature of the mix at the time of paving within the master range as defined in 320-6.3. The minimum frequency for taking mix temperatures on the roadway will be as indicated in 320-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. ~~The Engineer will be immediately notified~~ the Engineer of the rejection.

330-6.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

~~330-96.1.5 Number~~**Thickness and Spread Rate of Crews Required:** For each paving machine operated, use a separate crew, each crew operating **Layers:** Construct each layer as a full unit. ~~The Contractor's CTQP Paving Level II technician defined in charge~~ the following table:

Table 330-2	
Thickness and Target Spread Rate Requirements	
Mix Type	Specification Section and Article
Type SP	334-1
Type FC	337-8
Type B	234-8
ATPB	287-8

330-6.1.5.1 Thickness Control: Ensure the spread rate is within 5% of the ~~paving~~ target spread rate. When determining the spread rate, use, at a minimum, an average of five truckloads of mix. When the average spread rate is beyond plus or minus 5% of the target spread rate, monitor the thickness of the pavement layer closely and adjust the construction operations ~~may be responsible~~.

If the Contractor fails to maintain an average spread rate within plus or minus 5% of the target spread rate for ~~more than one crew but must be physically accessible to the two consecutive days~~, the Engineer ~~at all times when placing mix~~ may elect to stop the construction operation at any time until the issue is resolved.

~~330-9.1.6~~**Checking Depth of Layer:** Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32 feet to stabilize before the second check is made to determine the effects of the adjustment.

~~330-9.1.7 Hand Spreading:~~ In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.

~~330-9.1.8 Straightedging and Back-patching:~~ Straightedge and back-patch after obtaining initial compaction and while the material is still hot.

~~330-9.2 Requirements Applicable to Courses Other Than Leveling:~~

~~330-9.2.1 Spreading and Finishing:~~ Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike off the mixture to the full width required, and to such loose depth for each course that, when the work is completed, the required weight of mixture per square yard, or the specified thickness, is secured. Carry a uniform amount of mixture ahead of the screed at all times.

~~330-9.2.2 Thickness and Spread Rate of Layers:~~ Construct each course of Type SP mixtures in layers of the thickness shown in Section 334.

~~When the deficiency of.~~ **5.2 Maximum Spread Rate Tolerances:**

When the average spread rate for the total *structural or friction* course pavement thickness measured in accordance with 330-2.26.1.5.1 exceeds the ~~following~~ maximum spread rate ~~tolerance~~*tolerances shown in Table 330-3*, address the ~~deficient area~~ *unacceptable pavement* in accordance with 330-129.5.

~~1. Structural Course (non-friction)~~

~~a. For pavement of a design thickness of 2-1/2 inches or more: plus or minus 50 lbs per sy.~~

~~b. For pavement of a design thickness of less than 2-1/2 inches: plus or minus 25 lbs per sy.~~

~~2. Friction course~~

~~a. For open grade friction course: plus or minus 15 lbs per sy.~~

~~b. For dense grade friction course: plus or minus 25 lbs per sy.~~

<i>Table 330-3</i>		
<i>Maximum Spread Rate Tolerances</i>		
<i>Course</i>	<i>Design Thickness</i>	<i>Spread Rate Tolerance</i>
<i>Structural</i>	≥ 2.5 inches	± 50 lbs per sy
<i>Structural</i>	< 2.5 inches	± 25 lbs per sy
<i>Friction (dense)</i>	-	± 25 lbs per sy
<i>Friction (open)</i>	-	± 15 lbs per sy

As an exception, the Engineer may allow the Contractor to leave areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-129.5.2.

~~330-9.2.3 Laying Width:~~ If necessary due to the traffic requirements, lay the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, lay the mixture to the full width with machines traveling in echelon.

~~330-9.2.4~~ **330-6.1.6 Correcting Defects:** Before starting any rolling, check the surface; correct any irregularities; remove all drippings, ~~fat sandy~~*sand* accumulations

from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

~~330-9.3 Requirements Applicable Only to Leveling Courses:~~

~~330-9.3.1 Patching Depressions:~~ Before spreading any leveling course, fill all depressions in the existing surface more than 1 inch deep by spot patching with leveling course mixture, and then compact them thoroughly.

~~330-9.3.2 Spreading Leveling Courses:~~ Place all courses of leveling by. **7**
Hand Work: In limited areas where the use of two motor graders, equip one with a spreader box. Use other types of leveling devices after they have been approved by the Engineer.

~~330-9.3.3 Rate of Application:~~ When using Type SP 9.5 (fine graded) for leveling, do not allow the average spread of a layer to be less than 50 lb/yd² *the paver is impossible* or more than 75 lb/yd². The quantity of mix for leveling shown in the plans represents the average for the entire project; however *impracticable*, the Contractor may vary the rate of application throughout the project as directed by the Engineer. When leveling in connection with base widening, the Engineer may require placing all the leveling mix prior to the widening operation.

~~330-9.3.4 Placing Leveling Course Over Existing Pavement:~~ When the Contract Documents specify a leveling course to be placed over cracked concrete pavement, including existing concrete pavement covered with an asphalt surface, place the first layer of leveling course as soon as possible but no later than 48 hours after cracking the concrete *and finish the mixture by hand*.

~~330-9.3.5 Removal of Excess Joint Material:~~ Where placing a leveling course over existing concrete pavement or bridge decks, trim the excess joint filler in the cracks and joints flush with the surface prior to placing the first layer of the leveling course.

~~330-10~~ **330-7 Compacting Mixture.**

~~330-10.1 Provisions Applicable to All Types:~~

~~330-10.1.1 Equipment and Sequence:~~ For each paving operation, furnish a separate set of rollers, with their operators.

~~7.1 General Requirements:~~ When density testing for acceptance is required, select equipment, sequence, and coverage ~~of rolling to meet the specified density requirement. The coverage is the~~ (number of times the roller passes over a given area of pavement.) *of rolling to meet the specified density requirement*. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

~~330-7.2 Standard Rolling Procedure:~~ When density testing for acceptance is not required, propose an alternative rolling pattern to be approved by the Engineer or use the following standard rolling procedure:

1. ~~Seal (breakdown) Rolling~~ *Breakdown rolling*: Provide two static coverages with a tandem steel-wheeled roller, ~~weighing 5 to 15 tons~~, following as close behind the paver as possible without pick-up, undue displacement, or blistering of the material.

2. Intermediate rolling: Provide five static coverages with a pneumatic-tired roller, following as close behind the ~~seal (breakdown)~~ rolling operation as the mix will permit.

3. ~~Final~~*Finish* rolling: Provide one static coverage with a tandem steel-wheeled roller, ~~weighing 5 to 15 tons,~~ after completing the ~~seal (breakdown)~~ rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-10.1.2.7.3 Rolling Procedures: Utilize procedures that will uniformly compact the pavement layer to the desired density level, *while meeting the appropriate smoothness requirements, without damaging the pavement surface, crushing aggregate or leaving excessive roller marks, roller heads, or ripples. While rolling is in progress, monitor the surface continuously, and adjust the compaction operations to comply with the surface requirements.*

~~Roll across the mat, overlapping the adjacent pass by at least 6 inches. Roll slowly enough to avoid displacement of the mixture, and correct any displacement at once by the use of rakes and the addition of fresh mixture if required. Continue final rolling to eliminate all roller marks.~~

330-10.1.3.7.4 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, gutters, bridges, manholes, etc.

330-10.1.4 Rolling Patching and Leveling Courses: ~~Use pneumatic-tired rollers to roll all patching and leveling courses. When placing the initial leveling course over broken concrete pavement, use a pneumatic-tired roller that weighs at least 15 tons.~~

330-10.1.7.5 Correcting Defects: Do not allow the ~~rollers~~*compaction equipment* to deposit ~~gasoline, oil, or grease~~*contaminants* onto the pavement ~~surface~~. Remove and replace any areas damaged by such deposits as directed by the Engineer. ~~While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements in 330-12. Remove and replace all drippings, fat or lean areas, and defective construction of~~ *Correct* any ~~description~~. *Remedy* depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. ~~Correct all high spots, high joints, and honeycombing as directed by the Engineer. Remove and replace any mixture remaining unbonded after rolling.~~ Correct all defects prior to laying the subsequent course.

330-10.1.7.6 Use of Traffic Roller on First Overbuild Course: ~~Use a pneumatic-tired~~*traffic* roller on the first overbuild course. ~~Compact the pavement with a minimum of five coverages.~~

330-10.1.7 Use of Traffic Roller or Vibratory Roller on First Structural Layer Placed on an Asphalt Rubber Membrane Interlayer (ARMI): ~~Use a pneumatic-tired~~*a traffic* roller or ~~a~~ vibratory roller (*unless restricted by the Contract Documents*) on the first structural layer placed on an ARMI.

330-10.1.8.7.7 Compaction at Bridge Structures: Compact asphalt mixtures placed over bridge decks and approach slabs using static compaction only.

Utilize the standard rolling procedure described in 330-~~10.1.1~~7.2 or an alternative procedure approved by the Engineer.

330-~~11.8~~ Joints.

330-~~11.18.1~~ General: *When laying fresh mixture against the exposed edges of joints, place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.*

330-8.2 Transverse Joints: Place the mixture as continuously as possible. ~~Do not~~ to minimize transverse joints. When constructing permanent transverse joints, meet the surface requirements as defined in 330-9. Construct temporary transverse joints in such a manner to allow traffic to pass ~~the roller over the unprotected end of the freshly laid mixture except when discontinuing it.~~ When resuming the laying operation long enough to permit the mixture to become chilled. When thus interrupting the laying paving operation, construct a transverse joint by cutting back on the ~~previous run to expose~~ previously placed pavement at a location where the straightedge requirements are met. At the project limits, tie into the ~~full depth of adjoining pavement layers as shown in the~~ matpPlans.

330-~~11.28.3~~ Longitudinal Joints: ~~For all layers of pavement except the leveling course, place~~ Place each layer of pavement so that all longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. Plan offsets in advance so that longitudinal joints of the friction course are not in wheel path areas. The longitudinal joints for friction course layers should be within 6 inches of the lane edge or at the center of the lane. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

~~330-11.3 General: When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided above), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.~~

~~330-11~~ **330-8.4 Placing Asphalt Next to Concrete Pavement:** When placing asphalt next to concrete pavement, construct the joint ~~in accordance with Section 350~~ as shown in the pPlans.

330-~~12.9~~ Surface Requirements.

330-~~12.9.1~~ General: Construct a smooth pavement with good surface texture and the proper cross-slope.

330-~~12.9.2~~ Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Address any pavement not meeting the requirements of this specification in accordance with 330-~~12.9.5~~.

~~Regardless of pavement type, produce a pavement free of segregation. For dense graded structural and friction course mixtures, in areas not defined to be a density testing exception per 334-5.1.2, obtain for the Engineer three 6 inch diameter roadway cores at locations visually identified by the Engineer to be segregated. The Engineer will determine the density of each core in accordance with FM 1-T 166 and calculate the percent G_{mm} of the segregated area using the average G_{mb} of the roadway cores and the Quality-Control subplot G_{mm} for the questionable material. If the average percent G_{mm} is less than 90.0, address the segregated area in accordance with 330-9.5.~~

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface unless the section is greater than or equal to one mile in length and across the full width of the pavement, including shoulders and turn lanes. Exceptions to these requirements will be permitted if approved by the Engineer.

330-129.3 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish an electronic level with a length of 4 feet and an accuracy of 0.1 -degree, approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during paving operations.

330-129.3.1 Quality-Control Requirements: Calibrate the electronic levels a minimum of once per day before ~~any~~-paving ~~operation~~*operations begin*, in accordance with manufacturer's instructions.

Compare the ~~Quality-Control~~ level with the Verification level before ~~any~~-paving ~~operation~~*operations begin*, and at any time *as* directed by the Engineer. If the comparison between the ~~Quality Control~~ and Verification levels is within the comparison tolerance of plus or minus 0.2%, the ~~Quality Control~~ level is considered to compare favorably and can be used for measurement and acceptance of cross slopes. If the levels do not compare favorably, perform a second comparison using another calibrated electronic level (FDOT or Contractor) for resolution. If this resolution level compares favorably with the ~~Quality Control~~ level, the ~~Quality Control~~ level is considered to be verified. If the second level does not compare favorably with the ~~Quality Control~~ level, discontinue the use of the ~~Quality Control~~ electronic level and obtain another approved electronic level that meets the requirements of this specification. Regardless of the comparison analysis outcome, the Contractor assumes all risk associated with placing the pavement at the correct cross slope.

Measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. Record all ~~the~~-measurements to the nearest 0.1% on ~~an approved form~~*the Cross Slope Measurement Data Form (Form 700-010-98)* and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope ~~per lane~~-at a minimum frequency of one measurement every 100 feet *per lane*. Calculate the absolute deviation of *each* cross slope ~~at each~~-measurement and then average the absolute ~~deviation~~*deviations* of ten consecutive cross slope measurements. (The absolute deviation is the positive value of a deviation-) When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 330-24 and upon the approval of the Engineer, the frequency of ~~the~~ cross slope measurements can be reduced to one measurement every 200 feet during paving operations.

2. Superelevated Sections: Measure the cross slope every 100- feet per lane within the length of *the* full superelevation. Calculate the absolute deviation of each measurement and then average the absolute ~~deviation~~*deviations* of ten consecutive cross slope measurements. For ~~every~~*the* transition ~~section~~*sections*, measure the cross slope at control points identified in the ~~p~~Plans, or if not shown in the ~~p~~Plans, at a control point at the location of 0.0% cross slope and calculate the absolute deviation. For curves where the length of full superelevation is less than 250- feet, measure the cross

slope at the beginning point, midpoint and ending point of the fully superelevated sections, calculate the absolute deviation, and average-. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance, as shown in Table 330-24, stop the paving ~~operations~~*operation* and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table- 330-24, make corrections ~~(at no cost to the Department)~~ in accordance with 330-129.5 ~~only to cover~~*address* the deficient area ~~for of~~ the structural course ~~at no cost to the Department~~. *Complete all corrections before placement of the final pavement surface layer, unless stated otherwise in the pPlans, or as determined by the Engineer.* For pavement with multiple layers, the deficient areas for the structural course may be left in place, upon the approval of the Engineer. ~~Complete corrections before placement of the final design surface layer (Type SP layer or friction course layer), unless stated otherwise in the plans, or as determined by the Engineer.~~ For friction course layers, make corrections in accordance with 330-129.5.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Department.

Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if the deficiencies are sufficiently separated so as not to affect the overall traffic safety, surface drainage and ride quality characteristics of the pavement and the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

Table 330-24 Cross Slope Acceptance Tolerance		
Roadway Feature	Individual Absolute Deviation	Average Absolute Deviation
Tangent section (including turn lanes)	0.4%	0.2%
Superelevated curve	0.4%	0.2%
Shoulder	0.5%	0.5%

In the event that the distance between two edges of deficient areas is less than 100- feet, the correction work shall include the area between the deficient sections.

330-129.3.2 Verification: The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten cross slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of

three cross slope measurements on fully superelevated sections over a day's production. The Engineer will measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. If the average absolute deviation or an individual cross slope deviation falls outside of the acceptance tolerance as shown in Table 330-24, immediately make a comparison check at the QC test locations to verify the QC measurements in the ~~questionable~~ section. If the comparisons are beyond the acceptable comparison tolerance in accordance with 330-129.3.1, stop the paving operations until the ~~problem~~ issue is resolved to the satisfaction of the Engineer. Correct any cross slope not meeting the individual deviation acceptance tolerance in accordance with 330-129.5 at no cost to the Department. The Engineer reserves the right to check the pavement cross slope at any time by taking cross slope measurements at any location.

330-129.4 Pavement Smoothness: Construct a smooth pavement meeting the requirements of this Specification.

330-129.4.1 General: Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Obtain a smooth surface on all pavement courses placed, and then straightedge all layers as required by this ~~s~~Specification.

330-129.4.2 Test Method: Perform all straightedge testing in accordance with FM 5-509 in the outside wheel path of each lane. The Engineer, ~~or these~~ ~~specifications~~, may require additional testing at other locations within the lane.

330-129.4.3 Traffic Control: Provide traffic control in accordance with Section 102 and the Design Standards Index Nos. -607 or 619 -during all testing. When traffic control cannot be provided in accordance with Index Nos. -607 or 619, submit an alternative Traffic Control Plan as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

330-129.4.4 Process Control Testing: Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times. ~~Address in the QC Plan the methods to be used to control smoothness.~~

330-129.4.5 Quality-Control Testing:

330-129.4.5.1 General: Straightedge the final Type- SP structural layer and friction course layer in accordance with 330-129.4.2, regardless of whether the method of acceptance is by straightedge or laser profiler. Test all pavement lanes and ramps where the width is constant and document all deficiencies in excess of 3/16 inch on a form approved by the Engineer.

330-129.4.5.2 Straightedge Exceptions: Straightedge testing will not be required in the following areas: shoulders, intersections, tapers, crossovers, sidewalks, bicycle/shared use paths, parking lots and similar areas, or in the following areas when they are less than 250 feet in length: turn lanes, acceleration/deceleration lanes and side streets.

As an exception, in the event the Engineer identifies a surface irregularity in the above areas that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch in accordance with 330-129.5.

The Engineer may waive straightedge requirements for transverse joints at the beginning and end of the project, at the beginning and end of

bridge structures, at manholes, and at utility structures if the deficiencies are caused by factors beyond the control of the Contractor, as determined by the Engineer. In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

330-129.4.5.3 Intermediate Layers and Temporary Pavement:

When the design speed is 55 mph or greater and the intermediate Type SP layer or temporary pavement is to be opened to traffic, if the Engineer identifies a surface irregularity that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8- inch within 72 hours of placement in accordance with 330-129.5.

330-129.4.5.4 Final Type- SP Structural Layer: Straightedge the final Type SP structural layer in accordance with 330-129.4.2, either behind the final roller of the paving train or as a separate operation. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the **Quality-Control** straight edging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-129.5.

When the final structural course is to be opened to traffic and the design speed is 55- mph or greater, if any defect is 3/8 inch or greater, the Engineer may require deficiencies to be corrected within 72 hours after opening to traffic.

330-129.4.5.5 Friction Course Layer: Straightedge the friction course layer in accordance with 330-129.4.2, either behind the final roller of the paving train or as a separate operation upon completion of all paving operations. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the **Quality-Control** straightedging operations. Address all deficiencies in excess of 3/16- inch in accordance with 330-129.5. For laser acceptance, corrections may be made either before or after laser acceptance testing.

330-129.4.6 Acceptance:

330-129.4.6.1 Straightedge Acceptance: For areas of roadways where the design speed is less than 55 miles per hour, acceptance for pavement smoothness of the friction course will be based on verified **Quality-Control** measurements using the straightedge as required by 330-129.4.5. The Engineer will verify the straightedge testing by observing the **Quality-Control** straightedging operations.

330-129.4.6.2 Laser Acceptance: For areas of high speed roadways where the design speed is equal to or greater than 55 miles per hour, acceptance testing for pavement smoothness of the friction course (for mainline traffic lanes only) will be based on the Laser Profiler. Ramps, acceleration and deceleration lanes, and other areas not suitable for testing with the Laser Profiler will be tested and accepted with the straightedge in accordance with 330-129.4.5.5 and 330-129.4.6.1.

The pavement smoothness of each lane will be determined by a Laser Profiler furnished and operated by the Department in accordance with FM- 5-549 and a report issued with the Ride Number (RN) reported to one decimal place. If corrections are made, as required following Laser Acceptance, the pavement will not be retested for smoothness using the Laser Profiler.

For this testing, the pavement will be divided into 0.1-mile segments. Partial segments equal to or greater than 0.01 mile will be considered as a 0.1 mile segment. The pavement will be accepted as follows:

1) For segments with a RN greater than or equal to 4.0, the pavement will be accepted at full pay.

2) For segments with a RN less than 4.0, the Engineer will further evaluate the data in 0.01-mile intervals for both wheel paths.

If the RN is 3.5 or above for all 0.01 mile intervals in both wheel paths, the segment will be accepted at full payment.

If the RN is less than 3.5 for one or more 0.01-mile intervals, the segment will be tested with the rolling straightedge in both wheel paths in accordance with FM- 5-509. If approved by the Engineer, this straightedging may be completed (in both wheel paths) as part of the ~~Quality Control~~ straightedging operations described in 330-~~129~~.4.5.5, prior to testing with the laser profiler. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the ~~Quality Control~~ straightedging operations. Address all deficiencies in excess of 3/16-inch in accordance with 330-~~129~~.5.

Test and accept areas at the beginning and ending of the project, bridge approaches and departures, and areas where the segment is less than 0.01 mile, with the straightedge in accordance with 330-~~129~~.4.5.5 and 330-~~129~~.4.6.1.

330-~~129~~.5 Unacceptable Pavement:

330-~~129~~.5.1 Corrections: Address all areas of unacceptable pavement at no cost to the Department. Retest all corrected areas and assure the requirements of these ~~s~~Specifications are met.

330-~~129~~.5.1.1 Structural Layers: Correct all deficiencies, as defined in these Specifications, in the Type- SP structural layers by ~~one of the methods described below:~~ *removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane.*

~~a. Remove and replace the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane.~~

~~b. Mill~~ *As an exception option, for straightedge deficiencies only, mill* the pavement surface to a depth and width that is adequate to remove the deficiency. ~~(This option only applies if the structural layer is not the final surface layer.) This option does not apply to the final structural layer where the final surface layer will be an open-graded friction course (FC-5).~~

330-~~129~~.5.1.2 Friction Course: Correct deficiencies in the friction course or final surface layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane. As an exception, the Engineer may allow the ~~e~~Contractor to leave these areas in place ~~at~~ if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-~~129~~.5.2.

330-129.5.2 Reduction in Pay Item Quantity: When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons, the Department will base the reduction on the volume of material that the Contractor would have removed (the length by the lane width by layer thickness) multiplied by the maximum specific gravity of the mix as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times t \times G_{mm} \times 0.0024$$

Where: L = Lane length (ft.)

W = Lane width (ft.)

t = Layer thickness (in.)

G_{mm} = Maximum specific gravity from verified mix design

For FC-5 open-graded friction course, the Department will base the reduction on the area that the Contractor would have removed (the length by lane width) multiplied by a spread rate of 80 lb/yd² as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times 0.0044$$

Where: L = Lane length (ft.)

W = Lane width (ft.)

330-1310 Protection of Finished Surface.

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 inch by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense-graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160°F.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The Department may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.

HOT MIX ASPHALT – GENERAL CONSTRUCTION REQUIREMENTS.
(REV 7-20-11)

SECTION 330 (Pages 250–265) is deleted and the following substituted:

SECTION 330
HOT MIX ASPHALT -
GENERAL CONSTRUCTION REQUIREMENTS

330-1 Description.

This Section specifies the basic equipment and construction requirements for hot mix asphalt (including warm mix asphalt) pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-2 Quality Control (QC) Requirements.

330-2.1 Minimum QC Requirements: In addition to the requirements set forth in Section 105, describe in the Quality Control Plan (QCP) how the following attributes will be monitored: pavement density, mix temperature, pavement smoothness, pavement cross-slope, mix spread rate, and pavement texture, including methods for monitoring pavement segregation and the corrective actions that will be taken to resolve any identified problems. Perform as a minimum the following activities necessary to maintain process control and meet Specification requirements:

1. Pavement Density: Monitor the pavement temperature with an infrared temperature device so that compaction is completed before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement. Monitor the roadway density with either 6 inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement.

2. Mix Temperature: Determine the mix temperature at the roadway for the first five loads and one out of every five loads thereafter.

3. Mix Spread Rate: Monitor the mix spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed. When determining the spread rate, use, at a minimum, an average of five truckloads of mix.

4. Pavement Texture: Monitor the pavement texture to minimize pavement segregation. Use density gauges, infrared temperature measurement devices, or roadway cores at the beginning of each day's production, and as necessary, both at truck exchanges and during normal paving operations.

5. Reporting: Ensure the accuracy of the Quality Control Roadway Reports on the Department's approved form to reflect the actual surface area of the finished work and be in compliance with the requirements of the Contract Documents.

330-2.2 Personnel Qualifications: Provide QC Technicians in accordance with Section 105.

330-3 Limitations of Operations.

330-3.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the paving operations.

330-3.2 Limitations of Paving Operations:

330-3.2.1 General: Place the mixture only when the surface upon which it is to be placed has been previously prepared, is intact, firm, dry, clean, and the tack or prime coat, with acceptable spread rate, is properly broken or cured. Do not place friction course until the adjacent shoulder area has been dressed and grassed.

330-3.2.2 Ambient Air Temperature: Place the mixture only when the air temperature in the shade and away from artificial heat meets requirements of Table 330-1. The minimum ambient temperature requirement may be reduced by 5°F when using warm mix technology, if mutually agreed to by both the Engineer and the Contractor. For friction course mixtures, meet the requirements of 337-7.

Table 330-1	
Ambient Air Temperature Requirements for Paving	
Layer Thickness or Asphalt Binder Type	Minimum Temperature (°F)
≤ 1/2 inch	50
≤ 1 inch or any mixture containing a PG asphalt binder having a high temperature designation greater than PG 67	45
> 1 inch	40

330-3.2.3 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and standing water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 320-6.3, the Contractor may then place the mixture caught in transit.

330-3.2.4 Wind: Do not place the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.

330-4 Surface Preparation.

330-4.1 Cleaning: Prior to placing the mixture, clean the surface of the base or underlying pavement of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

330-4.1.1 Application over Asphalt Rubber Membrane Interlayer (ARMI): Where an asphalt mix is to be placed over a newly constructed ARMI, do not sweep or otherwise disturb the cover material prior to placing the asphalt mix, unless directed by the Engineer.

330-4.2 Tacking: Apply a tack coat on all existing pavement surfaces that are to be overlaid with an asphalt mix as specified in Section 300 and between successive layers

of all asphalt mixes. Apply a tack coat on freshly primed bases only when so directed by the Engineer.

330-5 Paving Equipment.

330-5.1 General Requirements: Use equipment that is mechanically sound and capable of consistently meeting the requirements of these Specifications.

330-5.2 Asphalt Paver:

330-5.2.1 General: Provide an asphalt paver that is self-propelled, can be steered, and is equipped with a receiving and distribution hopper and a mechanical screed. Use a mechanical screed capable of adjustment to regulate the depth of material spread and to produce the desired cross-section.

330-5.2.2 Automatic Screed Control: For all asphalt courses placed with an asphalt paver, equip the paver with automatic longitudinal screed controls of either the skid type, traveling stringline type, or non-contact averaging ski type with a minimum length of 25 feet. On the final layer of asphalt base, overbuild, and structural courses, and for friction courses, use the joint matcher in lieu of the skid, traveling stringline, or non-contact averaging ski on all passes after the initial pass. Equip the asphalt paver with electronic cross slope controls.

330-5.2.3 Screed Width: Provide an asphalt paver having a screed width greater than 8 feet when required to pave full width lanes. Do not use extendable screed strike-off devices that do not provide preliminary compaction of the mat in place of fixed screed extensions. Use a strike-off device only on irregular areas that would normally be done by hand and on shoulders 5 feet or less in width. When using the strike-off device on shoulders in lieu of an adjustable screed extension, demonstrate the ability to obtain an acceptable texture, density, and thickness.

When using an extendable screed device to extend the screed's width on the full width lane or shoulder by 24 inches or greater, the Engineer will require an auger extension, paddle, or kicker device unless written documentation from the manufacturer is provided that these are not necessary.

330-5.3 Rollers:

330-5.3.1 Steel-Wheeled Rollers: Provide compaction equipment capable of meeting the density requirements described in these Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a tandem steel-wheeled roller weighing 5 to 15 tons for breakdown rolling. For finish rolling, use a separate roller with a weight of 5 to 15 tons. Variations from these requirements shall be approved by the Engineer.

330-5.3.2 Traffic Rollers: Provide compaction equipment capable of meeting the density requirements described in the Specifications. In the event that density testing is not required, and the standard rolling pattern is used, provide a self-propelled, pneumatic-tired traffic roller equipped with at least seven smooth-tread, low pressure tires, equipped with pads or scrapers on each tire. Maintain the tire pressure between 50 and 55 psi or as specified by the manufacturer. Use rollers with a minimum weight of 6 tons. Do not use wobble-wheeled rollers. Variations from these requirements shall be approved by the Engineer.

330-5.3.3 Prevention of Adhesion: Do not allow the mixture to adhere to the wheels of any rollers. Do not use fuel oil or other petroleum distillates to prevent

adhesion. Do not use any method which results in water being sprinkled directly onto the mixture.

330-5.4 Coring Equipment: Furnish a suitable saw or drill for obtaining the required density cores.

330-5.5 Hand Tools: Provide the necessary hand tools such as rakes, shovels, and other similar tools, and a suitable means for keeping them clean.

330-6 Placing Mixture.

330-6.1 Requirements Applicable to All Pavement Types:

330-6.1.1 Alignment of Edges: Place all asphalt mixtures by the stringline method to obtain an accurate, uniform alignment of the pavement edge. As an exception, pavement edges adjacent to curb and gutter or other true edges do not require a stringline. Control the unsupported pavement edge to ensure that it will not deviate more than plus or minus 1.5 inches from the stringline.

330-6.1.2 Paving Width: If necessary due to the traffic requirements, place the mixture in strips in such a manner as to provide for the passage of traffic. As an option, where the road is closed to traffic, place the mixture to the full width with machines traveling in echelon.

330-6.1.3 Mix Temperature: Maintain the temperature of the mix at the time of paving within the master range as defined in 320-6.3. The minimum frequency for taking mix temperatures on the roadway will be as indicated in 320-6.3. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the master range shall be rejected for use on the project. Immediately notify the Engineer of the rejection.

330-6.1.4 Speed of Paver: Establish the forward speed of the asphalt paver based on the rate of delivery of the mix to the roadway but not faster than the optimum speed needed to adequately compact the pavement.

330-6.1.5 Thickness and Spread Rate of Layers: Construct each layer as defined in the following table:

Table 330-2	
Thickness and Target Spread Rate Requirements	
Mix Type	Specification Section and Article
Type SP	334-1
Type FC	337-8
Type B	234-8
ATPB	287-8

330-6.1.5.1 Thickness Control: Ensure the spread rate is within 5% of the target spread rate. When determining the spread rate, use, at a minimum, an average of five truckloads of mix. When the average spread rate is beyond plus or minus 5% of the target spread rate, monitor the thickness of the pavement layer closely and adjust the construction operations.

If the Contractor fails to maintain an average spread rate within plus or minus 5% of the target spread rate for two consecutive days, the Engineer may elect to stop the construction operation at any time until the issue is resolved.

330-6.1.5.2 Maximum Spread Rate Tolerances: When the average spread rate for the total structural or friction course pavement thickness measured in accordance with 330-6.1.5.1 exceeds the maximum spread rate tolerances shown in Table 330-3, address the unacceptable pavement in accordance with 330-9.5.

Table 330-3		
Maximum Spread Rate Tolerances		
Course	Design Thickness	Spread Rate Tolerance
Structural	≥ 2.5 inches	± 50 lbs per sy
Structural	< 2.5 inches	± 25 lbs per sy
Friction (dense)	-	± 25 lbs per sy
Friction (open)	-	± 15 lbs per sy

As an exception, the Engineer may allow the Contractor to leave areas in place if it is determined by the Engineer that the deficiency is not a significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-6.1.6 Correcting Defects: Before starting any rolling, check the surface; correct any irregularities; remove all drippings, sand accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.

330-6.1.7 Hand Work: In limited areas where the use of the paver is impossible or impracticable, the Contractor may place and finish the mixture by hand.

330-7 Compacting Mixture.

330-7.1 General Requirements: When density testing for acceptance is required, select equipment, sequence, and coverage (number of times the roller passes over a given area of pavement) of rolling to meet the specified density requirement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.2 Standard Rolling Procedure: When density testing for acceptance is not required, propose an alternative rolling pattern to be approved by the Engineer or use the following standard rolling procedure:

1. Breakdown rolling: Provide two static coverages with a tandem steel-wheeled roller, following as close behind the paver as possible without pick-up, undue displacement, or blistering of the material.

2. Intermediate rolling: Provide five static coverages with a pneumatic-tired roller, following as close behind the breakdown rolling operation as the mix will permit.

3. Finish rolling: Provide one static coverage with a tandem steel-wheeled roller, after completing the breakdown rolling and intermediate rolling, but before the surface pavement temperature drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

330-7.3 Rolling Procedures: Utilize procedures that will uniformly compact the pavement layer to the desired density level, while meeting the appropriate smoothness requirements, without damaging the pavement surface, crushing aggregate or leaving excessive roller marks, roller heads, or ripples. While rolling is in progress, monitor the surface continuously, and adjust the compaction operations to comply with the surface requirements.

330-7.4 Compaction of Areas Inaccessible to Rollers: Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, gutters, bridges, manholes, etc.

330-7.5 Correcting Defects: Do not allow the compaction equipment to deposit contaminants onto the pavement surface. Remove and replace any areas damaged by such deposits as directed by the Engineer. Correct any depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all defects prior to laying the subsequent course.

330-7.6 Use of Traffic Roller: Use a traffic roller on the first overbuild course. Use a traffic roller or vibratory roller (unless restricted by the Contract Documents) on the first structural layer placed on an ARMI.

330-7.7 Compaction at Bridge Structures: Compact asphalt mixtures placed over bridge decks and approach slabs using static compaction only. Utilize the standard rolling procedure described in 330-7.2 or an alternative procedure approved by the Engineer.

330-8 Joints.

330-8.1 General: When laying fresh mixture against the exposed edges of joints, place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

330-8.2 Transverse Joints: Place the mixture as continuously as possible to minimize transverse joints. When constructing permanent transverse joints, meet the surface requirements as defined in 330-9. Construct temporary transverse joints in such a manner to allow traffic to pass over it. When resuming the paving operation, construct a transverse joint by cutting back on the previously placed pavement at a location where the straightedge requirements are met. At the project limits, tie into the adjoining pavement layers as shown in the Plans.

330-8.3 Longitudinal Joints: Place each layer of pavement so that all longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. Plan offsets in advance so that longitudinal joints of the friction course are not in wheel path areas. The longitudinal joints for friction course layers should be within 6 inches of the lane edge or at the center of the lane. The Engineer may waive this requirement where offsetting is not feasible due to the sequence of construction.

330-8.4 Placing Asphalt Next to Concrete Pavement: When placing asphalt next to concrete pavement, construct the joint as shown in the Plans.

330-9 Surface Requirements.

330-9.1 General: Construct a smooth pavement with good surface texture and the proper cross-slope.

330-9.2 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Address any pavement not meeting the requirements of this specification in accordance with 330-9.5.

For dense graded structural and friction course mixtures, in areas not defined to be a density testing exception per 334-5.1.2, obtain for the Engineer three 6 inch diameter roadway cores at locations visually identified by the Engineer to be segregated. The Engineer will determine the density of each core in accordance with FM 1-T 166 and calculate the percent G_{mm} of the segregated area using the average G_{mb} of the roadway cores and the QC subplot G_{mm} for the questionable material. If the average percent G_{mm} is less than 90.0, address the segregated area in accordance with 330-9.5.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface unless the section is greater than or equal to one mile in length and across the full width of the pavement, including shoulders and turn lanes. Exceptions to these requirements will be permitted if approved by the Engineer.

330-9.3 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish an electronic level with a length of 4 feet and an accuracy of 0.1 degree, approved by the Engineer for the control of cross slope. Make this electronic level available at the jobsite at all times during paving operations.

330-9.3.1 QC Requirements: Calibrate the electronic levels a minimum of once per day before paving operations begin, in accordance with manufacturer's instructions.

Compare the QC level with the Verification level before paving operations begin, and at any time as directed by the Engineer. If the comparison between the Q C and Verification levels is within the comparison tolerance of plus or minus 0.2%, the Q C level is considered to compare favorably and can be used for measurement and acceptance of cross slopes. If the levels do not compare favorably, perform a second comparison using another calibrated electronic level (FDOT or Contractor) for resolution. If this resolution level compares favorably with the Q C level, the Q C level is considered to be verified. If the second level does not compare favorably with the Q C level, discontinue the use of the Q C electronic level and obtain another approved electronic level that meets the requirements of this specification. Regardless of the comparison analysis outcome, the Contractor assumes all risk associated with placing the pavement at the correct cross slope.

Measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. Record all measurements to the nearest 0.1% on the Cross Slope Measurement Data Form and submit to the Engineer for documentation.

1. Tangent Sections: Measure the cross slope at a minimum frequency of one measurement every 100 feet per lane. Calculate the absolute deviation

of each cross slope measurement and then average the absolute deviations of ten consecutive cross slope measurements. (The absolute deviation is the positive value of a deviation) When the average absolute deviation cross slope is consistently within the acceptance tolerance as shown in Table 330-4 and upon the approval of the Engineer, the frequency of cross slope measurements can be reduced to one measurement every 200 feet during paving operations.

2. **Superelevated Sections:** Measure the cross slope every 100 feet per lane within the length of the full superelevation. Calculate the absolute deviation of each measurement and then average the absolute deviations of ten consecutive cross slope measurements. For the transition sections, measure the cross slope at control points identified in the Plans, or if not shown in the Plans, at a control point at the location of 0.0% cross slope and calculate the absolute deviation. For curves where the length of full superelevation is less than 250 feet, measure the cross slope at the beginning point, midpoint and ending point of the fully superelevated sections, calculate the absolute deviation, and average. When the number of measurements is less than ten and the length of full superelevation is greater than 250 feet, average the absolute deviation of all measurements.

If the average absolute deviation of the cross slope measurements falls outside the acceptance tolerance, as shown in Table 330-4, stop the paving operation and make adjustments until the problem is resolved to the satisfaction of the Engineer. If an individual cross slope deviation falls outside the acceptance tolerance as shown in Table 330-4, make corrections at no cost to the Department in accordance with 330-9.5 to address the deficient area of the structural course. Complete all corrections before placement of the final pavement surface layer, unless stated otherwise in the Plans, or as determined by the Engineer. For pavement with multiple layers, the deficient areas for the structural course may be left in place, upon the approval of the Engineer. For friction course layers, make corrections in accordance with 330-9.5.

The limits of deficient areas requiring correction may be verified and adjusted with more accurate measurement methods, including survey instruments, upon approval by the Engineer at no cost to the Department.

Should the Contractor wish to have any corrections waived, submit a request to the Engineer for approval. The Engineer may waive the corrections at no reduction in payment if the deficiencies are sufficiently separated so as not to affect the overall traffic safety, surface drainage and ride quality characteristics of the pavement and the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at the beginning and end of the project, bridge approaches and similar areas, adjust the cross slope to match the actual site conditions, or as directed by the Engineer.

Table 330-4 Cross Slope Acceptance Tolerance		
Roadway Feature	Individual Absolute Deviation	Average Absolute Deviation

Tangent section (including turn lanes)	0.4%	0.2%
Superelevated curve	0.4%	0.2%
Shoulder	0.5%	0.5%

In the event that the distance between two edges of deficient areas is less than 100 feet, the correction work shall include the area between the deficient sections.

330-9.3.2 Verification: The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten cross slope measurements per lane per mile in tangent sections, control points in transition sections, and a minimum of three cross slope measurements on fully superelevated sections over a day's production. The Engineer will measure the cross slope of the compacted pavement surface by placing the level at the center location of a lane and perpendicular to the roadway centerline. If the average absolute deviation or an individual cross slope deviation falls outside of the acceptance tolerance as shown in Table 330-4, immediately make a comparison check at the QC test locations to verify the QC measurements in the section. If the comparisons are beyond the acceptable comparison tolerance in accordance with 330-9.3.1, stop the paving operations until the issue is resolved to the satisfaction of the Engineer. Correct any cross slope not meeting the individual deviation acceptance tolerance in accordance with 330-9.5 at no cost to the Department. The Engineer reserves the right to check the pavement cross slope at any time by taking cross slope measurements at any location.

330-9.4 Pavement Smoothness: Construct a smooth pavement meeting the requirements of this Specification.

330-9.4.1 General: Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Obtain a smooth surface on all pavement courses placed, and then straightedge all layers as required by this Specification.

330-9.4.2 Test Method: Perform all straightedge testing in accordance with FM 5-509 in the outside wheel path of each lane. The Engineer, may require additional testing at other locations within the lane.

330-9.4.3 Traffic Control: Provide traffic control in accordance with Section 102 and the Design Standards Index Nos. 607 or 619 during all testing. When traffic control cannot be provided in accordance with Index Nos. 607 or 619, submit an alternative Traffic Control Plan as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

330-9.4.4 Process Control Testing: Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times.

330-9.4.5 QC Testing:

330-9.4.5.1 General: Straightedge the final Type SP structural layer and friction course layer in accordance with 330-9.4.2, regardless of whether the method of acceptance is by straightedge or laser profiler. Test all pavement lanes and ramps where the width is constant and document all deficiencies in excess of 3/16 inch on a form approved by the Engineer.

330-9.4.5.2 Straightedge Exceptions: Straightedge testing will not be required in the following areas: shoulders, intersections, tapers, crossovers, sidewalks, bicycle/shared use paths, parking lots and similar areas, or in the following areas when they are less than 250 feet in length: turn lanes, acceleration/deceleration lanes and side streets.

As an exception, in the event the Engineer identifies a surface irregularity in the above areas that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch in accordance with 330-9.5.

The Engineer may waive straightedge requirements for transverse joints at the beginning and end of the project, at the beginning and end of bridge structures, at manholes, and at utility structures if the deficiencies are caused by factors beyond the control of the Contractor, as determined by the Engineer. In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

330-9.4.5.3 Intermediate Layers and Temporary Pavement: When the design speed is 55 mph or greater and the intermediate Type SP layer or temporary pavement is to be opened to traffic, if the Engineer identifies a surface irregularity that is determined to be objectionable, straightedge and address all deficiencies in excess of 3/8 inch within 72 hours of placement in accordance with 330-9.5.

330-9.4.5.4 Final Type SP Structural Layer: Straightedge the final Type SP structural layer in accordance with 330-9.4.2, either behind the final roller of the paving train or as a separate operation. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straight edging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

When the final structural course is to be opened to traffic and the design speed is 55 mph or greater, if any defect is 3/8 inch or greater, the Engineer may require deficiencies to be corrected within 72 hours after opening to traffic.

330-9.4.5.5 Friction Course Layer: Straightedge the friction course layer in accordance with 330-9.4.2, either behind the final roller of the paving train or as a separate operation upon completion of all paving operations. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5. For laser acceptance, corrections may be made either before or after laser acceptance testing.

330-9.4.6 Acceptance:

330-9.4.6.1 Straightedge Acceptance: For areas of roadways where the design speed is less than 55 miles per hour, acceptance for pavement smoothness of the friction course will be based on verified QC measurements using the straightedge as required by 330-9.4.5. The Engineer will verify the straightedge testing by observing the QC straightedging operations.

330-9.4.6.2 Laser Acceptance: For areas of high speed roadways where the design speed is equal to or greater than 55 miles per hour, acceptance testing

for pavement smoothness of the friction course (for mainline traffic lanes only) will be based on the Laser Profiler. Ramps, acceleration and deceleration lanes, and other areas not suitable for testing with the Laser Profiler will be tested and accepted with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

The pavement smoothness of each lane will be determined by a Laser Profiler furnished and operated by the Department in accordance with FM 5-549 and a report issued with the Ride Number (RN) reported to one decimal place. If corrections are made, as required following Laser Acceptance, the pavement will not be retested for smoothness using the Laser Profiler.

For this testing, the pavement will be divided into 0.1 mile segments. Partial segments equal to or greater than 0.01 mile will be considered as a 0.1 mile segment. The pavement will be accepted as follows:

1) For segments with a RN greater than or equal to 4.0, the pavement will be accepted at full pay.

2) For segments with a RN less than 4.0, the Engineer will further evaluate the data in 0.01 mile intervals for both wheel paths.

If the RN is 3.5 or above for all 0.01 mile intervals in both wheel paths, the segment will be accepted at full payment.

If the RN is less than 3.5 for one or more 0.01 mile intervals, the segment will be tested with the rolling straightedge in both wheel paths in accordance with FM 5-509. If approved by the Engineer, this straightedging may be completed (in both wheel paths) as part of the QC straightedging operations described in 330-9.4.5.5, prior to testing with the laser profiler. Notify the Engineer of the location and time of straightedge testing a minimum of 48 hours before beginning testing. The Engineer will verify the straightedge testing by observing the QC straightedging operations. Address all deficiencies in excess of 3/16 inch in accordance with 330-9.5.

Test and accept areas at the beginning and ending of the project, bridge approaches and departures, and areas where the segment is less than 0.01 mile, with the straightedge in accordance with 330-9.4.5.5 and 330-9.4.6.1.

330-9.5 Unacceptable Pavement:

330-9.5.1 Corrections: Address all areas of unacceptable pavement at no cost to the Department. Retest all corrected areas and assure the requirements of these Specifications are met.

330-9.5.1.1 Structural Layers: Correct all deficiencies, as defined in these Specifications, in the Type SP structural layers by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane.

As an option, for straightedge deficiencies only, mill the pavement surface to a depth and width that is adequate to remove the deficiency. This option only applies if the structural layer is not the final surface layer.

330-9.5.1.2 Friction Course: Correct deficiencies in the friction course or final surface layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on both sides (where possible) of the defective area for the full width of the paving lane. As an exception, the Engineer may allow the Contractor to leave these areas in place if it is determined by the Engineer that the deficiency is not a

significant detriment to the pavement quality. A reduction to the pay item quantity will be made in accordance with 330-9.5.2.

330-9.5.2 Reduction in Pay Item Quantity: When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons, the Department will base the reduction on the volume of material that the Contractor would have removed (the length by the lane width by layer thickness) multiplied by the maximum specific gravity of the mix as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times t \times G_{mm} \times 0.0024$$

Where: L = Lane length (ft.)

W = Lane width (ft.)

t = Layer thickness (in.)

G_{mm} = Maximum specific gravity from verified mix design

For FC-5 open-graded friction course, the Department will base the reduction on the area that the Contractor would have removed (the length by lane width) multiplied by a spread rate of 80 lb/yd² as determined through the following equation:

$$\text{Quantity (tons)} = L \times W \times 0.0044$$

Where: L = Lane length (ft.)

W = Lane width (ft.)

330-10 Protection of Finished Surface.

Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.

Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

Equip blade graders operating adjacent to the pavement during shoulder construction with a 2 inch by 8 inch or larger board, or other attachment providing essentially the same results, attached to their blades in such manner that it extends below the blade edge in order to protect the pavement surface from damage by the grader blade.

To prevent rutting or other distortion, protect sections of newly finished dense-graded friction course and the last structural layer prior to the friction course from traffic until the surface temperature has cooled below 160°F.

The Contractor may use artificial methods to cool the pavement to expedite paving operations. The Department may direct the Contractor to use artificial cooling methods when maintenance of traffic requires opening the pavement to traffic at the earliest possible time.